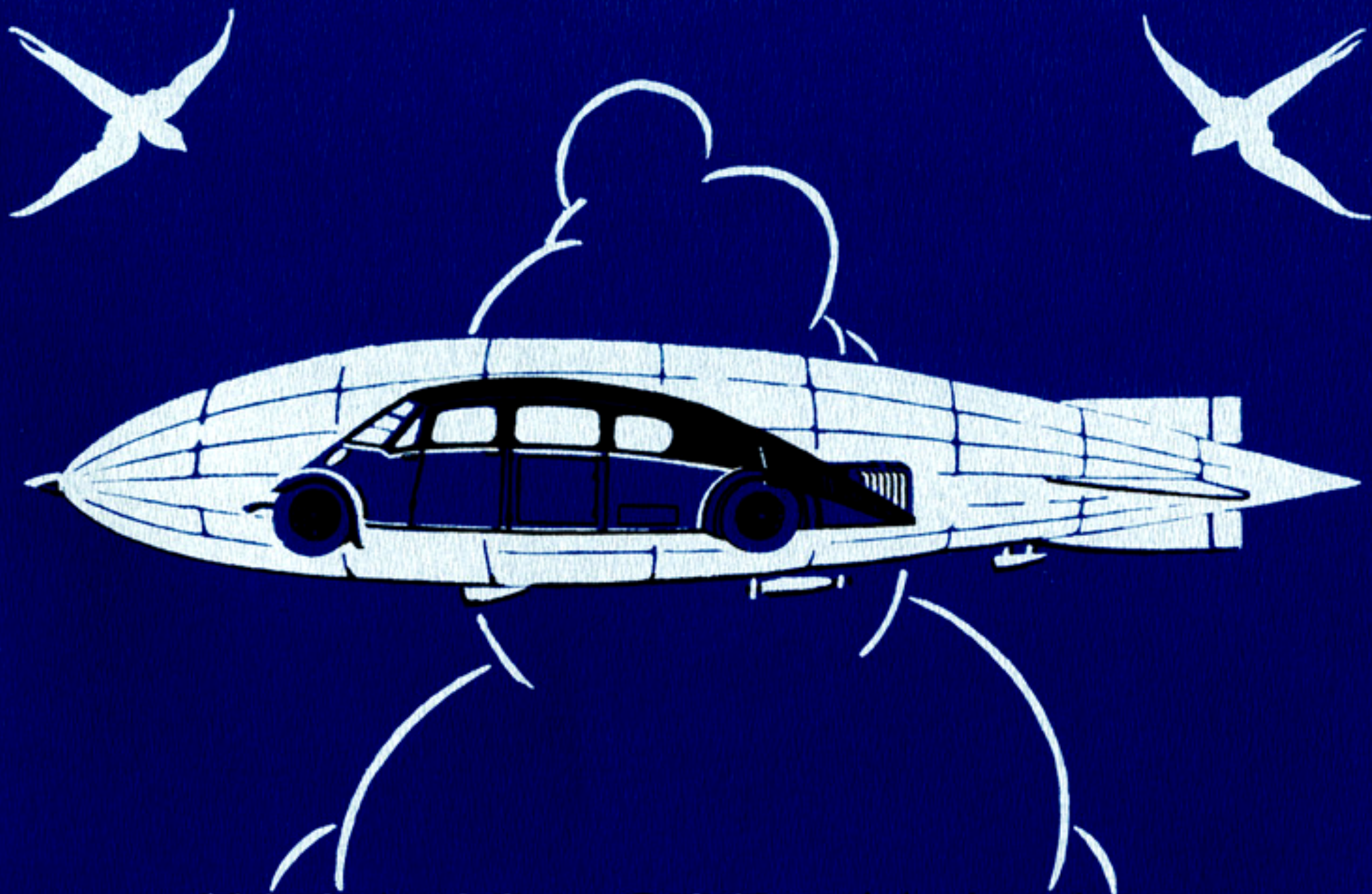




BURNEY—STREAMLINE

BURNEY STREAMLINE

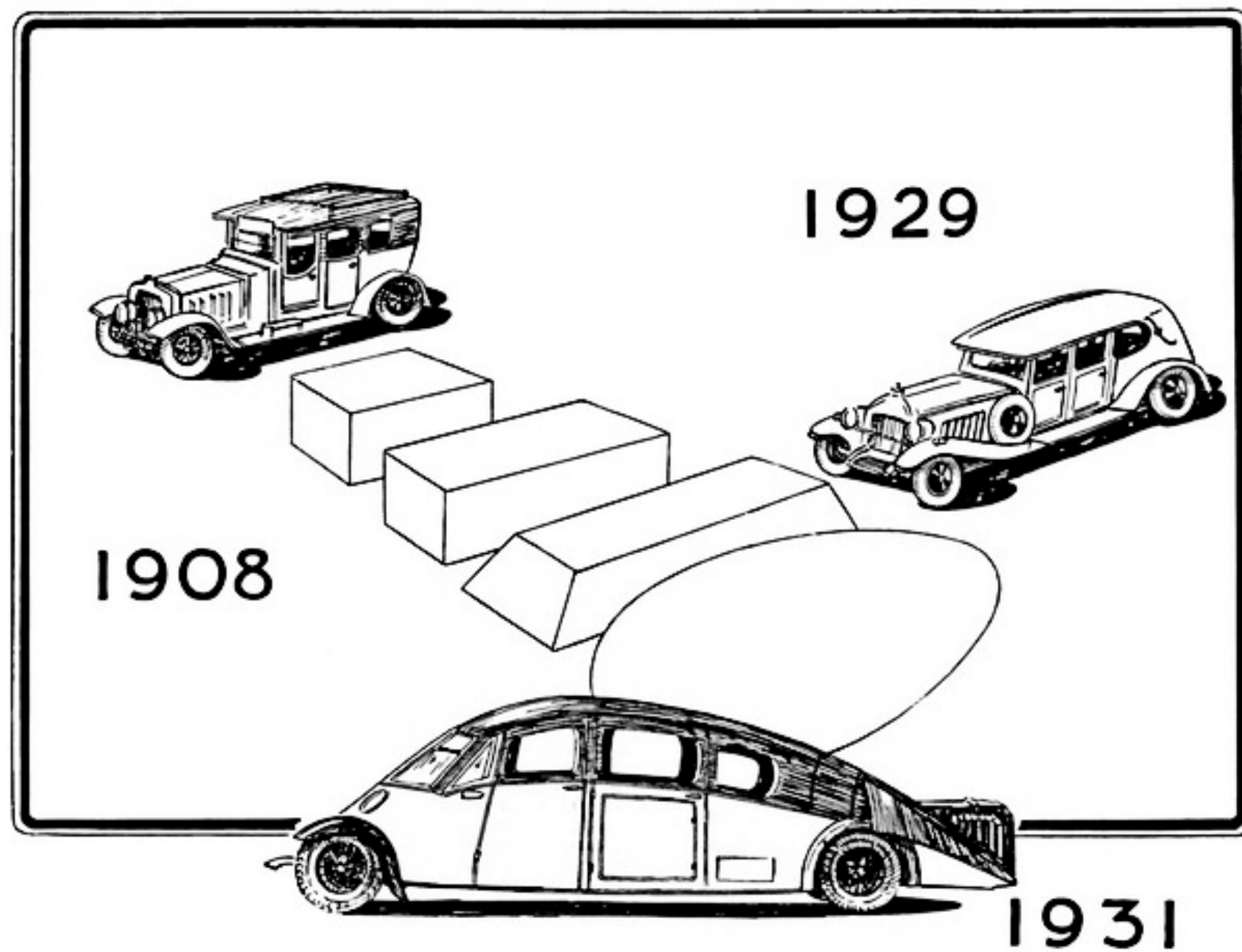


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The Evolution of the Streamline Car



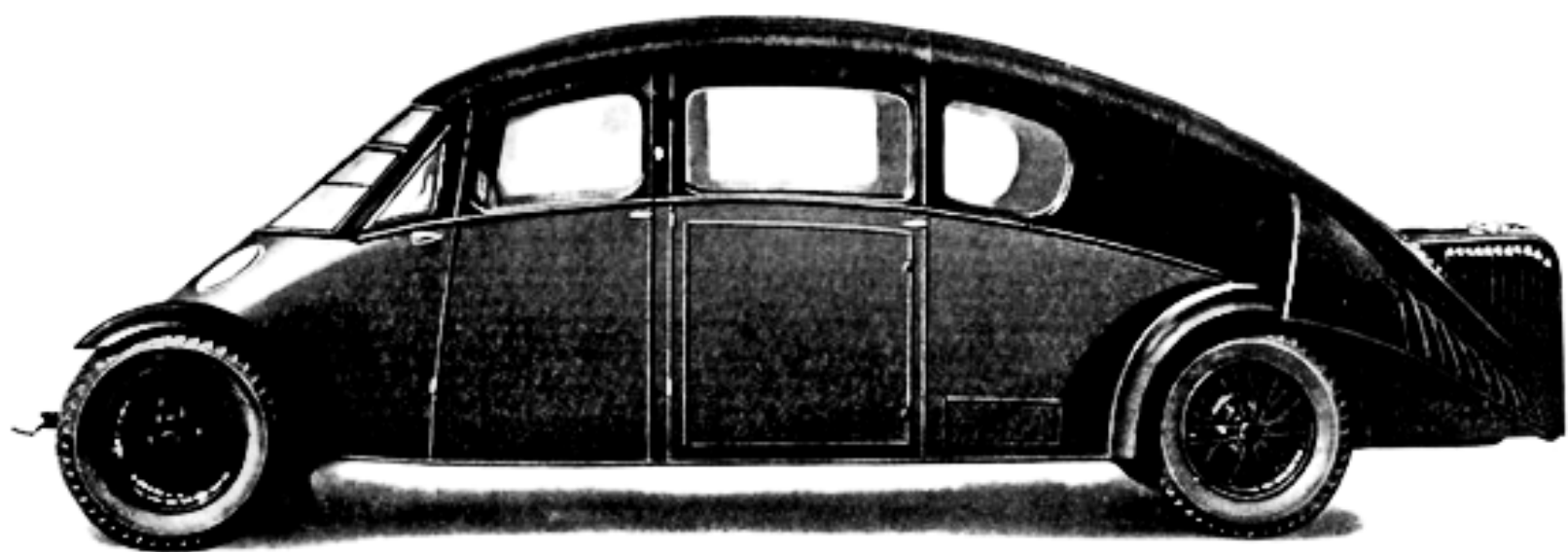
THE BURNEY STREAMLINE CAR

Introduction

IT will be realised from the ensuing description of the Burney Streamline Car, that the advantages claimed for it are of very considerable magnitude. Before detailing these advantages however, it is necessary to emphasise the difference in the character of the claims which are made for it as compared with the advantages claimed by one orthodox car over another.

For instance, in a comparison between the most expensive luxury car and a good type of mass production car, the advantages claimed for the expensive car are in the nature of refinements over the cheaper car, but both cars are of the same general design. Thus both cars will have their engines in front, and all the noise, heat, smell and vibration from the engine will be taken directly back to the passengers. The advantages claimed by the more expensive car will be in general, that, owing to hundreds of thousands of pounds spent upon development and research, the noise, heat, smell and vibration from the engine will be reduced as compared with the cheaper car.

Similarly with regard to springing and the general comfort in which the passengers are carried. Both cars will be carrying their back passengers on seats placed behind the back axle ; in other words, in the one position in the car more than any other, where the passengers will inevitably be thrown about over a rough road. The advantages claimed by the more expensive car will be that owing, once more, to great expenditure upon research their springing is better and more equable than that of the cheaper car.



The above illustration shows the straight-fronted model as opposed to the bonnet type of front. Either type can be supplied.

Advantages

THE advantages claimed by the Burney Streamline Car are based upon fundamental reasons of shape and structure and are due to a complete redesign of the car as a whole. For instance the engine is carried behind the back axle, and consequently none of the noise, heat, smell or vibration is carried back to the passengers, and it would probably be impossible for the passengers in the vehicle to know whether the expensive engine of the luxury car, or the cheaper engine of the mass production car was in operation. Similarly with regard to the springing. In the Burney Streamline Car all the passengers are carried well between the axles in the most favourable position in the car, and the increased comfort resulting will be much greater than any minor difference between the cheaper or more expensive form of springing as applied to the normal car.

Another feature of considerable importance which emerges from a detailed analysis of the advantages of the Burney Streamline Car is that it combines the attributes of a Sports Car with the high standard of comfort of a luxury car. It provides therefore in one and the same car a vehicle which will appeal to the man who likes a lively car and to the woman to whom comfort makes an appeal.

Accordingly, throughout the description, the only advantages claimed for the Burney Streamline Car will be those which are fundamental and basic, and do not depend upon refined detailed design, or great expenditure upon detailed

development. The actual detailed design of the Burney Streamline Car is of course of the same degree of excellence as is found in the normal luxury car, and whilst full advantage is taken of the particulars presented by the basic overall design, no detail however small, has been neglected to add to these advantages to the greatest possible extent.

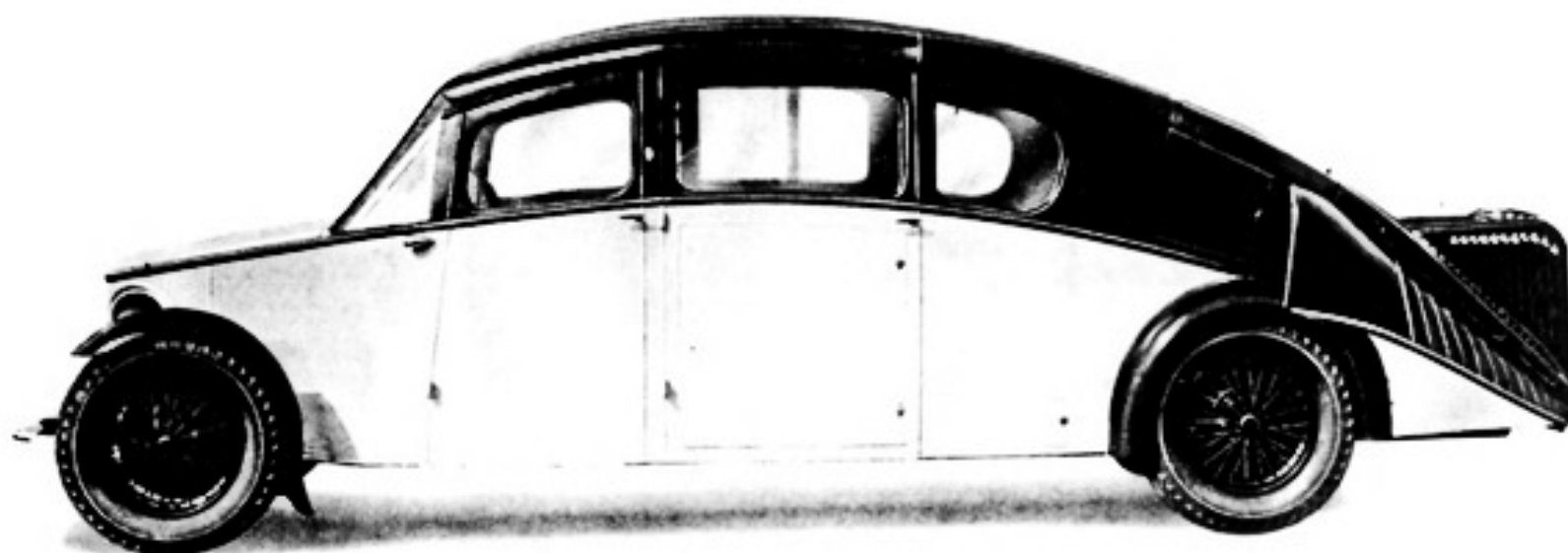
The advantages of the Burney Streamline Car can be grouped under 4 main headings:

- (1) ECONOMIC. Reduction of running costs to approximately 50% of the orthodox car for the same performance.
- (2) INCREASED COMFORT.
- (3) INCREASED SAFETY.
- (4) EASE OF MAINTENANCE.

(1) Economic Advantages

STREAMLINE SHAPE REDUCES AIR RESISTANCE AND SO SAVES PETROL CONSUMPTION.

In propelling the car over level ground there are two kinds of resistance. One is what is termed tractive resistance and depends mainly upon the character of the surface travelled over and the weight of the car, and the other is air resistance. Of these two, air resistance is by far the more important, and in racing cars may rise to as much as 95% of the whole resistance. At a normal road speed of



Broadside view of the car, and illustrates the generally smooth surface which contributes to low air resistance, ease of cleaning and maintenance.

30-70 miles per hour the proportion of the resistance due to air will vary from 20-80%, the higher figure being of course for the higher speed. If, therefore, it were possible to eliminate air resistance altogether, one could save between $\frac{1}{4}$ and $\frac{3}{4}$ of one's petrol bill, because the engine consumes petrol in direct proportion to the power which it has to develop, and the power which it has to develop is also directly proportionate to the resistance which it has to overcome.

Now it is not possible to eliminate air resistance altogether but it is possible to reduce it to a very great extent. The elimination of air resistance has gone furthest in the field of aviation, and as an example of what can be done in this respect, it is interesting to consider the achievement made with the Airship R.100. In this ship, the air resistance, by properly shaping the vessel, has been reduced to only 2% or 1/50th of the resistance which would be encountered by a flat plate of the same diameter.

In a motor car there are various excrescences such as wheels, which cannot be eliminated, but the Burney Streamline Car saves approximately 50% of the air resistance as compared with a normal car, as will be readily appreciated from a glance at its smooth surface in the illustration on page 4.

Now the reduction of this air resistance is of vital importance, because it means that if we take an average of the savings on all cruising speeds, the Burney Streamline Car only requires half the horse power of an ordinary car giving the same seating accommodation when running on a level road surface. In other words, quite irrespective of the type of engine and carburettor used, the Burney Streamline Car inherently saves nearly half the petrol bill.

SAVING IN TYRE WEAR DUE TO REDUCTION IN POWER TRANSMITTED BY WHEELS.

The tyre wear of a car depends mainly upon two factors: the weight which is to be carried and the power which is transmitted by the wheels. Obviously if the power required is reduced, as instanced in the case of the Burney Streamline Car, by the fact that the petrol consumption is reduced, the tyre wear must also be reduced. The actual saving the Burney Streamline Car would obtain from this reduction in power transmitted, depends largely upon the speed at which the car is driven. If the car is driven at the same average speed as the orthodox car is driven, then the saving will be in proportion to the saving in petrol; but if, as may happen, the average cruising speed is raised owing to the higher average cruising speed of the Burney Streamline type, the saving in this respect may be transformed into higher average speeds.

REDUCTION IN BODY WEIGHT OF CAR.

The other saving on tyre wear, which is due to weight reduction, is also almost proportionate to the petrol saving. For instance, the seven seater Burney Streamline Saloon designed for a top speed of 80 miles per hour has an unladen weight of 38 cwt. The orthodox car, carrying a seven seater saloon body and capable of 80 miles per hour has an average weight of 56 cwt., showing a saving to the Burney Streamline Car of approximately one ton. The saving in tyre wear is directly proportionate to the weight carried. It is therefore obvious that the Burney Streamline Car which provides equivalent passenger accommodation will, when driven at the same speed as the orthodox car, save approximately half the petrol and half the tyre upkeep, so that the question every motor user must ask himself is, *why should I continue to pay twice as much for my motoring as I need.*



The above illustration shows how the spare wheels are carried in the doors of the car. This form of stowage keeps the spare wheels clean and also reduces the possibility of theft.

Comfort

(2) Increased Comfort

The factors making for increased comfort can be divided under five headings :—

- (1) Good springing, giving freedom from pitching, swaying and rolling.
- (2) Elimination of noise, heat, smell and vibration given forth by the engine.
- (3) Elimination of body rattle.
- (4) Good head room, and easy embarking and disembarking of passengers.
- (5) London taxicab type of lock on front wheels.

These will now be taken in order, and it will again be shown how the Burney Streamline Car, owing to its overall design, has inherent advantages over the orthodox car, which no amount of argument can gainsay.

SUPERIOR METHOD OF SPRINGING MAKES FOR SMOOTHER RUNNING.

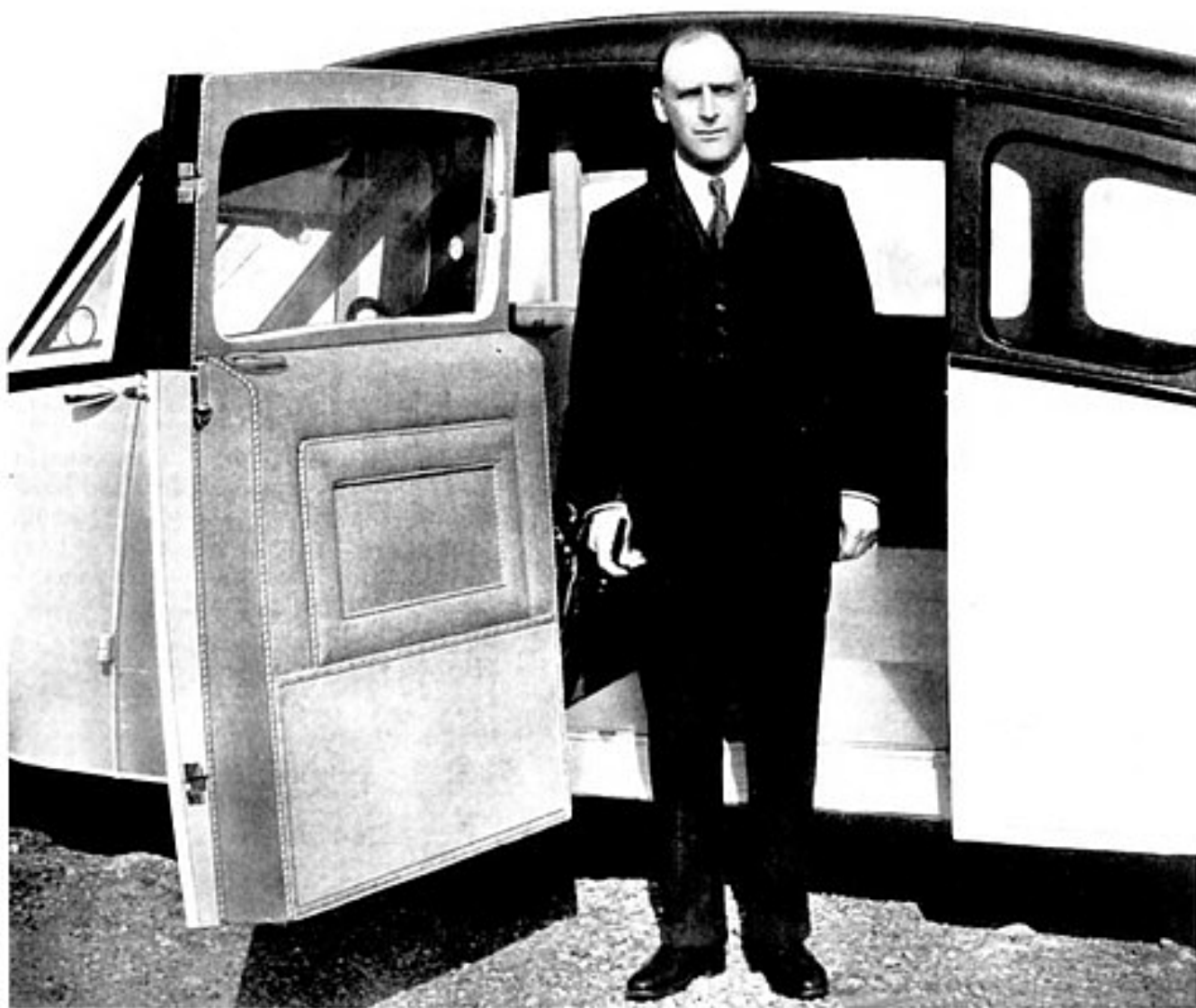
The springing depends mainly upon the proportion between the sprung weight and the unsprung weight. For instance, in an orthodox car, the back axle, differential and part of the propellor shaft and torque tube, are all unsprung, because there is no spring between them and the road. The springs are between these portions and the remainder of the car, with the exception of course, of the front wheel and axle. In the Burney Streamline Car the only portions which are unsprung

are the wheels and the brakes. Every other portion of the car is sprung. This has been achieved by the elimination of both the front and rear axle, and there is the added advantage that each wheel is independently sprung, so that the shock taken by one wheel cannot be transmitted to another. To obtain an accurate impression of the smoother running and more equable motion that this form of springing gives to the Burney Streamline Car as compared to the normal car, it is necessary to ride in the car when the difference will at once be felt. It is impossible to express this difference in terms of quantitative measurement as can be done in the case of tyre wear or petrol consumption ; all that can be said is that the proportion of unsprung weight to sprung weight in the Burney Streamline Car is very much less than is the case in the orthodox car.

ELIMINATION OF ENGINE NOISE, HEAT, SMELL AND VIBRATION.

It is hardly necessary to emphasise the increased comfort that will be provided by placing the engine at the back instead of the front of the car. In all types of normal car the engine is in front, with the result that the current of air passing through the radiator, brings back to the passengers all the heat, noise, and smell that the engine gives forth. This is why the saloon is always so stuffy.

A further irritant is the engine noise and vibration. Not only is there the vibration of the engine itself, but this is amplified by the fact that the propellor shaft has to connect



The above illustration shows the wide door and easy access to the back seats as well as the good head room but low overall height of the car.

the engine with the back axle, so that all vibrations are transmitted throughout the whole length of the car. In the Burney Streamline Car the engine is placed behind the axis of the back wheels (see page 6), with the result that these inconveniences will be eliminated, and the heat, smell, noise and vibration of the engine will be carried away from the passengers instead of towards them.

UNITAL FRAME ELIMINATES BODY RATTLE.

In the ordinary car the chassis is designed as one unit, and the body is designed as a separate unit, and these two units are mated together into the complete car. Once they have been put together they have to work as one unit. They are however, of very different construction. The chassis is made as a rule, of a steel frame some 7 ins. deep and the body has a depth of 5 ft. or more. When the car is travelling over a bumpy road there is always a certain amount of flexure in the body as well as in the chassis. It is however, a technical impossibility to design a 7 in. frame that will flex to the same degree as a 5 ft. beam, and in consequence the body is always working against the chassis. Sooner or later this continual working causes looseness and therefore rattle, and as every experienced motorist knows, over a rough road it is possible to observe a certain amount of looseness and movement between the doors and the dashboard. With a view to overcoming this inherent disadvantage some motor car manufacturers of the luxury type of car, have gone so far as to put in a sub-frame on the top of the ordinary chassis, in order to minimise the main cause of body rattle. In the Burney Streamline Car this matter is dealt with fundamentally. The chassis, as such, is eliminated altogether, and the main beam which carries both the engine and the body, is made the full depth of the car. Strong steel members are taken up through the roof as well as where the normal chassis exists,

and these members are all secured together by a transverse frame at each end of the car. Body, engine and transmission are then connected to this unital frame, and at one stroke the question of independent movement between the body and the chassis is entirely eliminated, and as a necessary corollary, the body rattle likewise.

MORE HEAD ROOM, AND MORE SPACIOUS ACCOMMODATION.

The shape of the Burney Streamline Car lends itself to giving Good Head Room where it is required, namely in the centre of the car. This allows of high doors and does away with the necessity of passengers having to crouch to get into the car. Secondly the elimination of the propellor shaft enables the floor of the body to be dropped to the level of the running board of the normal car, thus enabling the passengers to step straight into the car without having to take an extra step (see page 10).

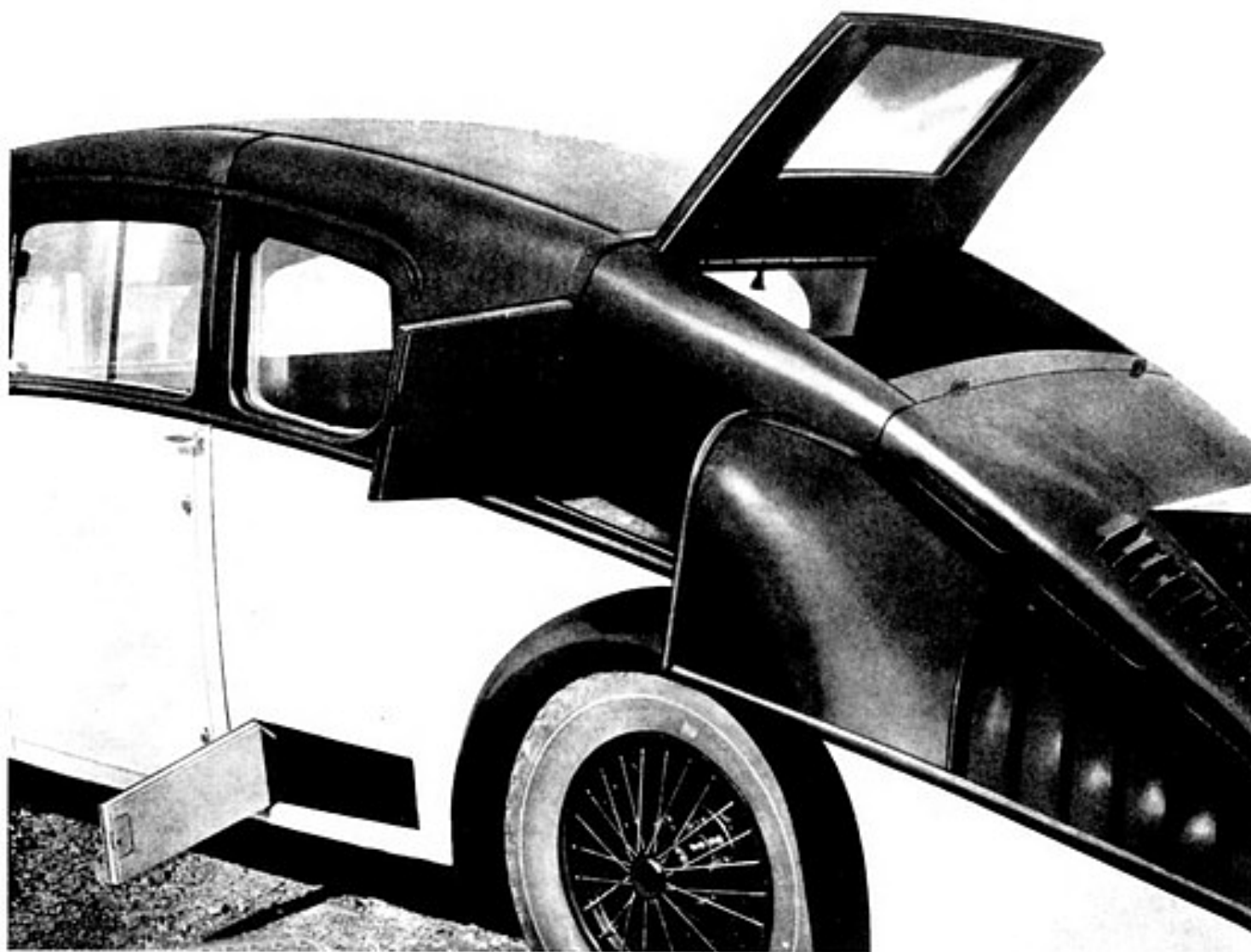
The height thereby saved is added to the body, enabling greater head room to be obtained, and allowing still larger doors to be fitted. The more spacious accommodation for passengers is not the least of the advantages of the Burney Streamline Car. There is also a special compartment for luggage. (See page 12).

(3) Increased Safety

When it comes to a question of safety, the Burney Streamline Car has many factors which give it an advantage over the normal car.

THE ADVANTAGES OF A LOWER CENTRE OF GRAVITY.

Road holding and the elimination of side rolling are both largely dependent upon having a low centre of gravity. Here again, the Burney Streamline Car has a much lower



Shows the position of the luggage space, which is between the engine and the passengers, thus affording a sound proof bulk head and minimising any noise given off by the engine. Side doors are fitted as well as the top door.

centre of gravity than it is possible to obtain with the orthodox car, owing to the elimination of the propellor shaft between the engine and the back axle. The combined result of the independently sprung wheels and of this low centre of gravity, is to enable the car to take corners at a speed which would turn over the orthodox car.

INCREASED BRAKING POWER DUE TO SUPERIOR OVERALL DESIGN OF THE CAR.

Since it has been made clear that for a given speed the Burney Streamline Car requires only half the engine power as compared with the orthodox car, it is obvious that for a given horse power a considerably higher speed can be obtained. But this increase of speed might become a mixed blessing if it were not for the fact that at the same time increased braking capacity is given to the car. The advantages claimed for the Burney Streamline Car are inherent in the overall design, and are not dependent upon the detailed design of the brakes themselves.

To make this clear it is only necessary to consider what actually happens when the brakes are put on hard. The first action on braking a car is for the car to tend to continue to move forward, and for the rim of the tyre where it is touching the road to be retarded; and as a consequence there is a turning moment set up which tries to make the car turn head over heels. This overturning moment varies, and is dependent upon the efficiency of the tyres, and on the height of the vertical centre of gravity of the car as a whole. In normal cars of course there is no danger, however hard the brakes are applied, of the car turning head over heels. What happens in practice is that there is a virtual shift of weight off the back tyres to the front tyres. In a normal car the weight on the back and front wheels,

under normal circumstances is approximately equal, and therefore when the brakes are put on very hard, the actual weight on the front wheels is considerably in excess of the weight on the back wheels, and this is why the front brakes of a car are more powerful and efficient than the back brakes. In other words one may describe the braking system of an ordinary car, as becoming relatively more inefficient the harder the brakes are put on, because the back wheels will be doing less work as the weight is thrown forward to the front wheels. If skidding of the wheels never took place this would not matter, but in actual practice, as every motorist knows, there comes a time when a wheel will not retard the car any further, and this produces the skid. When this takes place the control of the car as a whole is endangered. In a Burney Streamline Car $\frac{2}{3}$ of the weight is normal on the back wheels and only $\frac{1}{3}$ on the front wheels, and the braking does not reach its maximum effect until the shift of the weight has been so effected that all four wheels are bearing the same amount of weight. Thus there is a margin of virtual weight which can be shifted and covers all normal practice.

THE SHIFTING OF WEIGHT FROM FRONT TO BACK AXLE REDUCES LIKELIHOOD OF FRONT TYRE BURSTS.

When travelling at a high speed under touring conditions as is often done on the Continent, the motorist's greatest bugbear is the fear of a front tyre burst. In a Burney Streamline Car this fear is so reduced as to be almost eliminated, if reasonable care is taken to keep the tyres in good running condition. The reason for this is also quite obvious, when the matter is considered in detail, as it is again dependent upon the overall design of the car. A car has necessarily to be equipped with tyres of equal



The above illustration shows how the front lamps are concealed within the contour of the body line, thus eliminating the air resistance which lamps mounted as in the normal car would involve. The lamps are fitted with a dipping arrangement and also the tunnel on the inside serves as a reflector and enables the sign-posts to be read at night, without dismounting from the car.

size, and the actual size of tyre fitted is dependent upon the weight of the car. Owing to the fact that $\frac{2}{3}$ of the weight of the Burney Streamline Car is on the back axle, and $\frac{1}{3}$ on the front axle, the tyres on the front have 100% margin on the maker's schedule, and the stresses of the tyres are of course reduced in proportion. The margin against a burst tyre on the front is therefore greatly in excess of the orthodox car. Nor is this all. Owing to the elimination of weight on the front axle, the actual power required on the driving wheel, to keep the car on the road in the event of a tyre burst, is also reduced in proportion.

**STRONGER FRAMEWORK OF THE CAR
AFFORDS GREATER PROTECTION TO THE PASSENGERS
IN CASE OF A CRASH.**

Another advantage which the Burney Streamline Car has over the orthodox car is that its special form of construction affords greater protection to the passengers in the event of a head on collision. In the Burney Streamline Car strong steel girders are taken up through the roof and pass over the heads of the passengers, and are fixed to the foremost part of the car. The passengers are therefore protected by these steel girders. In the orthodox car, whilst admittedly the engine is in front of the passengers, and the passengers are relatively further from the front axle than in the Streamline Car, the fact remains that the comparatively weak body of the saloon affords insufficient protection in the event of a head on crash. *Summing up therefore, we may say that the inherent factors which make for increased safety, namely a lower centre of gravity, increased braking power, and the partial elimination of front tyre bursts, are more than sufficient to safeguard the increased speed at which the Burney Streamline Car is likely to be operated.*

(4) Maintenance

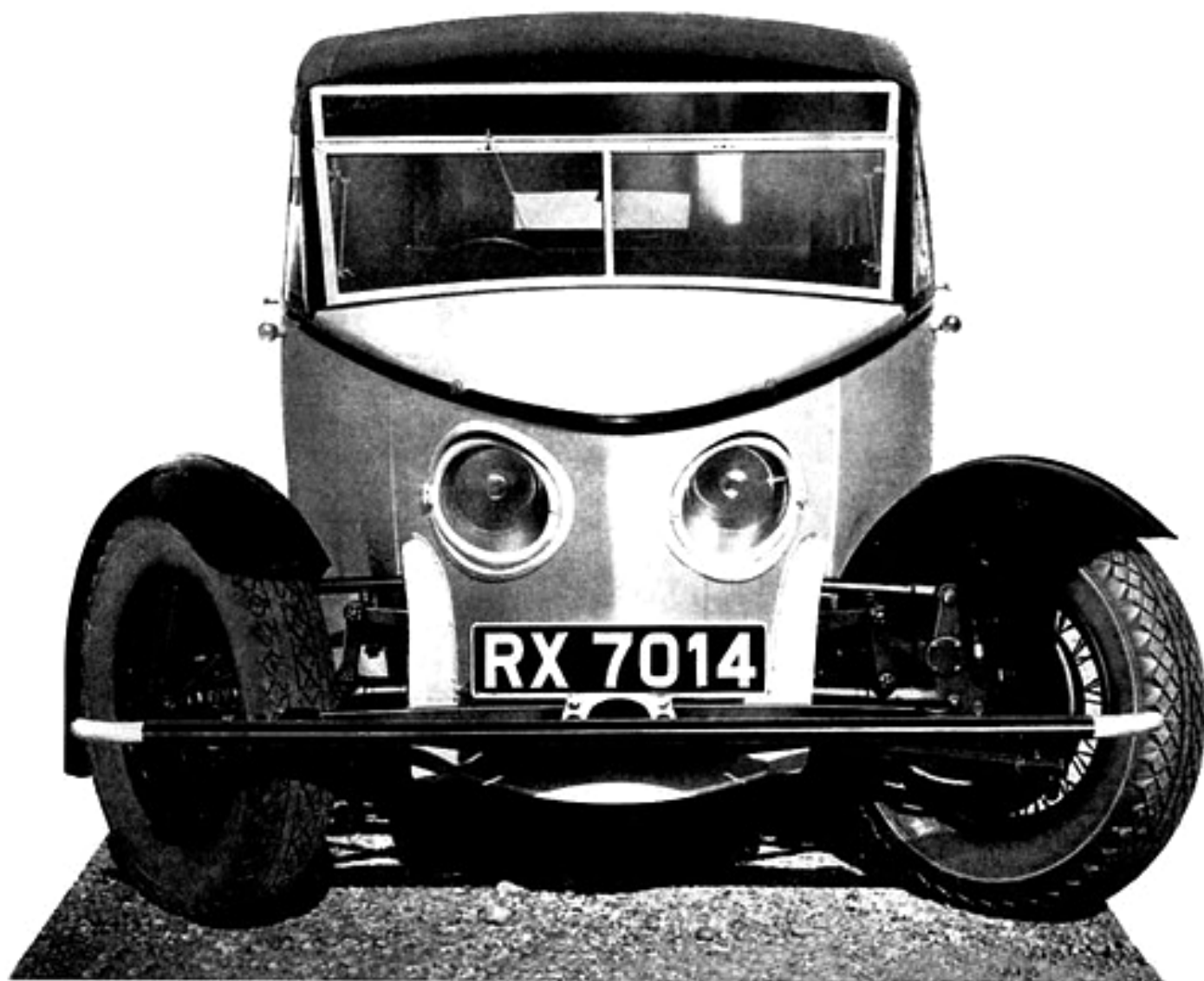
**BURNEY STREAMLINE CAR EASIER TO CLEAN AND CHEAPER
TO MAINTAIN.**

The question of maintenance is of great importance to the owner driver, and in a lesser degree with the chauffeur driven car. Without doubt by far the greater proportion of time and money expended upon keeping a car in running order is spent in the actual cleaning of the car. The washing and polishing of the body work does not as a rule take very long, but the time is expended on the excrescences, such as lamps, running boards, wind screens and the many places in the car where there are re-entrant angles. The Burney Streamline Car has a marked advantage in this respect since the whole of the outside is smooth, and all extras such as lamps, spare tyres, luggage compartment and the like are entirely enclosed within the smooth Streamline body. It is likely therefore, that it would not take half as long to clean a Streamline as an orthodox car.

GENERAL.

The other main causes of expenditure of time upon maintenance concerns the frequency or otherwise in having to change tyres and the stopping of rattling due to parts working loose. The former of these factors depends upon the power transmitted, and the weight of the car, and the latter upon the general efficiency of the springing and the method by which the body is secured to the chassis.

From the description already given it is quite obvious that the maintenance requirements of the Burney Streamline Car will be much reduced as compared with the ordinary car.



The above illustration shows the 50 degree lock of the front wheels. This very large lock enables the car to turn in a circle of 39 feet and is much less than in existing cars of the same wheel base. The advantage of being able to turn a long car in a small circle needs no emphasis.

Conclusion

It will be seen from the foregoing account that the leading features of the Streamline principle are :—

- (1) The radical reduction of air resistance.
- (2) The carrying of the engine behind the back axle.
- (3) The uniform construction of the body and the chassis.
- (4) Increased comfort due to the springing.
- (5) Increased safety, given by a lower centre of gravity and better braking.

It must not be imagined however, that this principle is only applicable to luxury cars. On the contrary it can be applied equally to small and large cars alike. The same proportionate advantages accrue to the 8 horse power as to the 50 horse power car. Moreover in addition to having all these technical advantages, the Burney Streamline Car has also, as we have shown, the overwhelming economic advantage of providing motoring at half cost. Its claim therefore, to be "the" car is seen to be unassailable.

Note.

The production model is fitted with a 22 horse power RAC rating 8 cylinder engine, and the following are the general characteristics of the car.

Wheel base 12 ft. 5 ins.

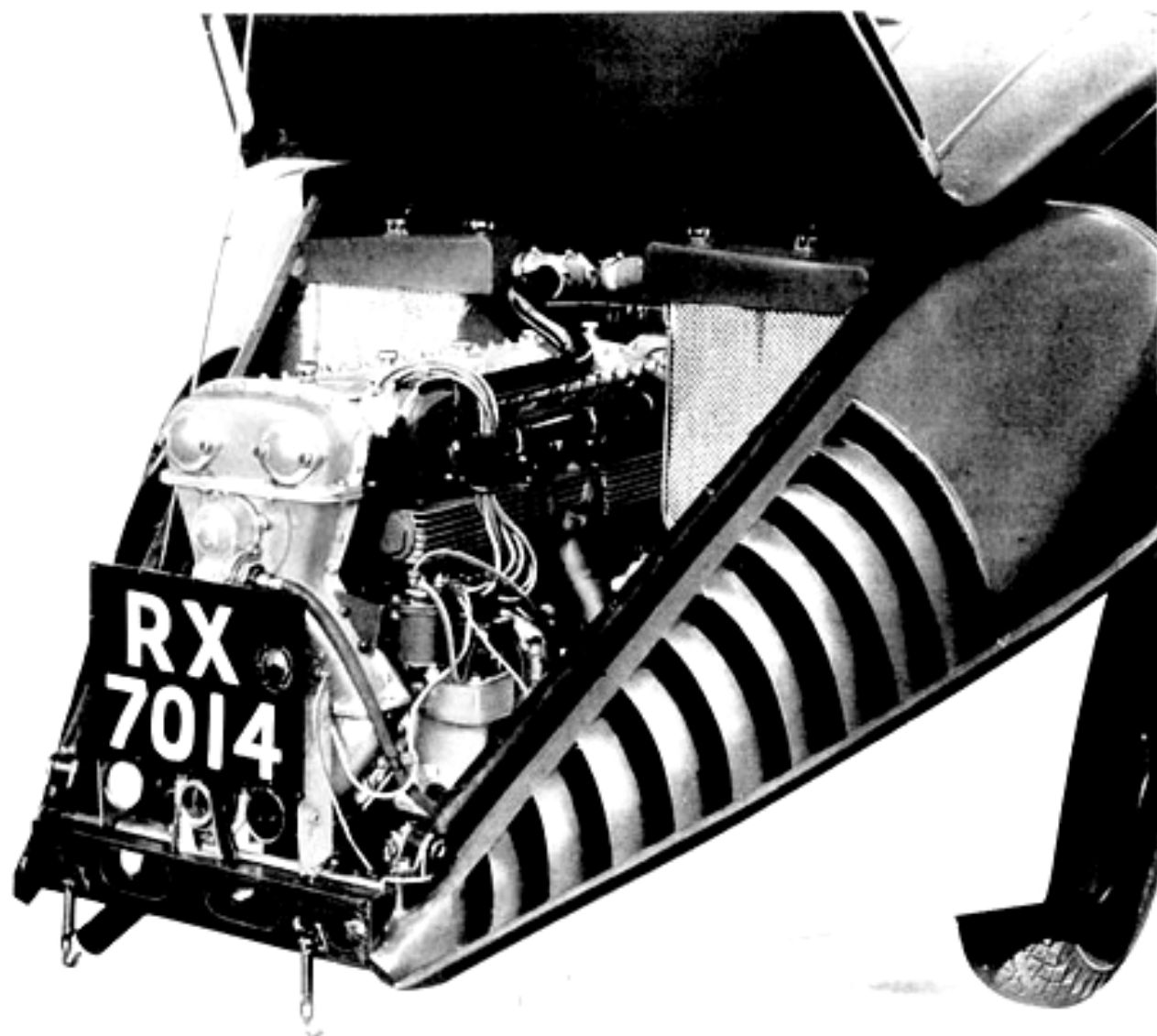
Weight including the 7 seater saloon body, 38 cwt., complete with water, oil, tools, spare wheels, etc.

Maximum speed on the level 80 m.p.h. Turning circle, approximately 39 ft. Four speed gear box, with direct 3rd speed and silent top. Equipment includes all the usual fittings and two spare tyres.

Two models are made—one as on page 6 with the "bonnet" front and the other as on page 4 with the Streamline front. The latter is of less resistance but to some motorists may be too unorthodox in appearance.

Petrol consumption, as tested with 4 up and at an average speed of 37 miles an hour, is 21.2 miles per gallon.

Price £1500



View showing the engine carried behind the back axle, giving good accessibility, and cut off from the passenger quarters by the luggage compartment.

Specification

ENGINE.—Straight eight Beverley Barnes. Bore and stroke 66 mm. x 108 mm. Cubic capacity 2956 cc. Maximum output 80 b.h.p. at 3,600 r.p.m.

TAX.—£22 per annum.

CRANKSHAFT.—Nine main bearings.

VALVES.—Inclined overhead type.

CAMSHAFT.—Gear driven from crankshaft, helical toothed "fabroil" pinion being interposed to ensure silent operation. No rocker gear used, side thrust from cams is taken upon piston shaped members interposed between valve stems.

LUBRICATION.—60 lbs. sq. in. pressure fed lubrication, arranged for main bearings and big ends, subsidiary feeds to overhead valve mechanism and gears.

PISTONS.—Aluminium, connecting rods Duralumin.

IGNITION.—12 volt Marelli Coil and Distributor, sparking plugs centrally placed in combustion chamber.

COOLING.—By means of 2 radiators and air scoops at sides of car. Air forced through by fans belt-driven from camshafts. Circulation is assisted by a water pump.

CARBURETTOR.—Zenith "V" type dual.

CLUTCH.—Single plate, drive taken through hollow worm to gear box, worm casing interposed between clutch and gear box, thus lessening overhang of engine past rear angle. Overall ratios are:—

1st	—	14.5 to 1
2nd	—	8.6 to 1
3rd (direct)	—	5.2 to 1
4th	—	4 to 1
Reverse	—	14 to 1

Silent 3rd speed, with an overspeed 4th for touring.

FRONT SPRINGS.—Single transverse. Friction type shock absorbers.

FRONT AXLE.—No front axle, in the ordinary sense, is used. Wheels independently sprung, permitting either wheel to rise without the other, thus cutting out principal cause of "high speed wobble." Independent steering has been given to each wheel by adoption of trackrod layout.

STEERING GEAR.—Gearbox Bishop Cam gear type, giving easy steering with minimum of backlash.

REAR SPRINGS.—Two transverse Cantilever, arranged to prevent car rolling. Independent springs to each wheel. Radius rods and torque tubes fitted, front and rear wheels.

GEAR.—Change speed gear lever located in centre of car, also hand-brake lever.

BRAKES.—Lockhead Hydraulic Braking system fitted on all wheels, hand-brake operates shoes on rear wheels and is adjustable.

STARTER.—12 volt starter is fitted.

FUEL PUMP.—12 volt. Petrol gauge.

LIGHTING.—Dipping reflector head lamps, side lamps, instrument panel lights, reversing light and stop light. Tail lamp illuminating number plate by means of translucent panel, the numbers being painted thereon. Interior roof light.

BUMPERS.—Front bumper bar is fitted.

TYRES.—30 x 6.5 tyres fitted. Detachable wire wheels. Spare tyres fitted inside doors of car.

HEATING.—Exhaust gas heaters are fitted at front and rear and are controllable.

PETROL SYSTEM.—14 gallon tank fitted front of car under bonnet, together with headlamps, steering box and batteries.

WHEEL BASE.—12' 5", i.e., 149".

TRACK.—60" front, 56" back.

TURNING CIRCLE.—39' each side. Lock 50°.

CHASSIS LUBRICATION.—Pressure and Silent Block.

GROUND CLEARANCE.—10½ inches.

